Claims

[1] A plasma chamber comprising:
a chamber body for defining a reaction space capable of forming plasma by a sidewall, a lower exterior wall, and an upper dome;
a plasma source coil arranged on the dome, for including unit coils arranged to have a predetermined turning number "n" calculated using a predetermined value of $n=a \times (b/m)$ (where "a" and "b" are both positive integers, and "m" is indicative of the number of unit coils corresponding to an integer greater than "2", allowing the unit coils to be extended from a center bushing which has a predetermined radius at a center part, and allowing the unit coils to be spirally arranged along a circumference of the center bushing, such that the plasma is formed in the reaction space; and
a cylindrical-shaped edge bushing which is arranged between the dome of the chamber body and the plasma source coil, and overlaps with an edge of the wafer disposed in the reaction space.

[2] The plasma chamber according to claim 1, wherein the edge bushing is formed of a ceramic or polymer-based material.

[3] A plasma chamber comprising:
a chamber body for defining a reaction space capable of forming plasma by a sidewall, a lower exterior wall, and an upper dome; and
a plasma source coil arranged on the dome, including a plurality of unit coils having a plurality of turning numbers,
wherein the plurality of unit coils are extended from a center busing having a predetermined radius, are spirally wound along a circumference of the center bushing, and a distance between a wafer edge and the dome is relatively longer than a distance between a wafer center and the dome.

[4] The plasma chamber according to claim 3, wherein the unit coils are arranged to have a predetermined turning number "n" calculated using a predetermined value of $n = a \times (b/m)$ (where "a" and "b" are both positive integers, and "m" is indicative of the number of unit coils corresponding to an integer greater than "2".

[5] A plasma chamber comprising:
a chamber body for limiting a size of a reaction space capable of forming plasma by a sidewall, a lower exterior wall, and an upper dome; and
a plasma source coil arranged on the dome, for allowing a plurality of unit coils having a plurality of turning numbers to be extended from a center bushing which has a predetermined radius at a center part, and allowing the unit coils to

be spirally arranged along a circumference of the center bushing, in which, as the unit coils are arranged in a direction from a center part of a wafer to an edge of the wafer, a distance from the dome is gradually increased, such that the unit coils are arranged stepwise and the plasma is formed in the reaction space.

[6] The plasma chamber according to claim 5, wherein the unit coils are arranged to have a predetermined turning number "n" calculated using a predetermined value of n=a × (b/m) (where "a" and "b" are both positive integers, and "m" is indicative of the number of unit coils corresponding to an integer greater than "2".

[7] A method for etching a wafer comprising the steps of:
a) preparing not only a first plasma source coil in which a plasma density at an edge of the wafer is less than the other plasma density at a center part of the wafer, but also a second plasma source coil in which the plasma density at the edge of the wafer is higher than the other plasma density at the center part of the wafer;
b) determining whether an F/C (Fluorine/Carbon) ratio of the etching gas is high or low;
c) if the F/C ratio is high, performing an etching process using the first plasma source coil; and
d) if the F/C ratio is low, performing an etching process using the second plasma source coil.

[8] The method according to claim 7, wherein the first plasma source coil has a concave-type structure wherein the first plasma source coil is more concave in the center part than in the edge of the wafer in the direction of a chamber body.

[9] The method according to claim 7, wherein the second plasma source coil has a convex-type structure wherein the second plasma source coil is more convex in the center part than in the edge of the wafer in the direction opposite to a chamber body.

[10] The method according to claim 7, wherein the step b) includes the steps of:
if the F/C ratio of the etching gas is higher than "2"determining that the etching gas has a high F/C ratio; and
if the F/C ratio of the etching gas is equal to or less than "2" determining that the etching gas has a low F/C ratio.

[11] The method according to claim 10, wherein the etching gas having the F/C ratio greater than "2" generates less polymers acting as by-products as compared to the other etching gas having an F/C ratio less than or equal to "2".

[12] The method according to claim 11, wherein:
the etching gas having the F/C ratio greater than "n" is indicative of an etching

gas including at least one of CF_4, C_2F_6, C_3F_8, and CHF_3; and
the other etching gas having the F/C ratio less than or equal to “2”is indicative of an etching gas including at least one of C_4F_8, C_5F_8, CH_3F, CH_2F_2, and C_4F_6.